MEA 2009–2010

Science Grade 8

The table below shows the entire eighth grade science test design. Scores are based on common items only, half of which are released and can be found in this document.

Test Design

Content Area	Common		Field Test Items		Total Items per Student		Base Testing Time	Points
	MC	CR	MC	CR	MC	CR		
Science	40	4	8	1	48	5	105 min.	56

Each item on the MEA measures a content standard of Maine's 2007 *Learning Results*.

Science Content Standards Assessed on the MEA

D. The Physical Setting
1. Universe and Solar System
2. Earth
3. Matter and Energy
4. Force and Motion

E. The Living Environment
1. Biodiversity
2. Ecosystems
3. Cells
4. Heredity and Reproduction
5. Evolution

Item Information Chart

Please refer to the item information chart on the next page for in-depth information on each science released item. The released item numbers in the chart correspond to item numbers in the practice test and on the MEA Item Analysis Report.

Constructed-Response Scoring Guides

A constructed-response scoring guide includes score point descriptions used to determine the score. Training notes that follow the scoring guide provide in-depth descriptions or particular information also used to determine the score.

Student Work

At least one sample student response is provided for each score point with annotations that explain the reasoning behind the assigned score.

Grade 8 Science Released Item Information

Released Item Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Practice Test Page Number	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6
Content Strand (Maine 2007 Learning Results)	E1	E3	D4	D1	D2	E5	E2	D3	E4	D1	D3	E4	D3	D3	D3	D2	E1	D2	D3	D2	D4	E5
Depth of Knowledge Code	2	1	2	1	2	1	2	3	1	1	2	2	2	2	1	2	3	2	1	3	3	3
Item Type	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	CR	CR
Possible Points	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4
Answer Key	D	A	D	C	A	A	B	B	D	B	A	B	A	B	B	A	A	C	B	D		
% Who Chose A or Earned 1 Point	6	89	13	4	47	83	15	20	5	12	63	9	31	21	18	50	73	10	8	11	15	27
% Who Chose B or Earned 2 Points	4	3	16	10	35	7	60	54	2	42	13	78	37	38	67	33	5	20	69	13	41	33
% Who Chose C or Earned 3 Points	2	4	15	72	4	6	18	8	3	37	8	5	20	29	7	8	16	58	14	11	21	23
% Who Chose D or Earned 4 Points	88	4	56	13	13	4	7	18	90	10	16	7	11	12	7	9	5	12	8	65	18	4
Statewide Average Student Score																					2.34	1.77

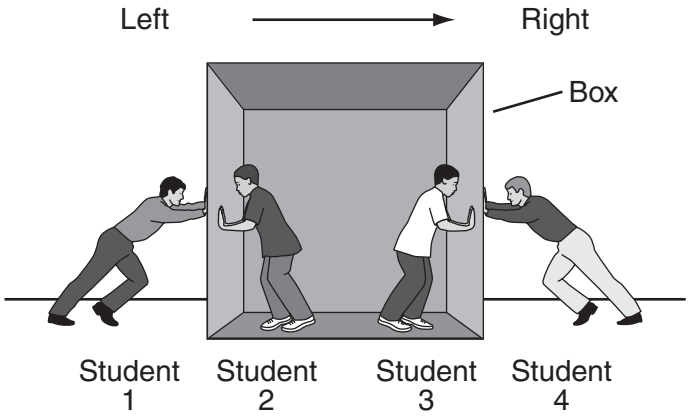
Content Strands: See "MDOE Regulation 132—Learning Results: Parameters for Essential Instruction" at http://www.maine.gov/education/lres/pei/index.html.

Item Type: MC = multiple-choice, CR = constructed-response

Answer Key: the letter of the correct answer choice

Constructed-Response Item 21

21 In the diagram below, four students are pushing a rigid box with unequal forces from different positions. As a result, the box starts moving toward the right.



a. Identify which student(s) is causing the box to move to the right.

b. Explain what the effect on the box will be if students 2 and 3 stop pushing on the box.

c. Explain what the effect on the box will be if student 1 stops pushing on the box.

Scoring Guide for Constructed-Response Item 21

Score	Description
4	Response demonstrates a thorough understanding of the effects of multiple forces on an object and how unbalanced forces will cause changes in the direction. The response identifies which students are causing the box to move to the right, explains what the effect on the box is if students 2 and 3 stop pushing on the box, and explains what the effect on the box is if student 1 stops pushing on the box. The response has no errors or omissions.
3	Response demonstrates a general understanding of the effects of multiple forces on an object and how unbalanced forces will cause changes in the direction. The response has one error or omission.
2	Response demonstrates a limited understanding of the effects of multiple forces on an object and how unbalanced forces will cause changes in the direction. The response has many errors or omissions.
1	Response demonstrates a minimal understanding of the effects of multiple forces on an object and how unbalanced forces will cause changes in the direction. The response has one correct piece of information.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Constructed-Response Item 21

a. The box moves to the right because of the net force applied by students 1 and 4. As the box is moving toward the right, student 1 is applying more force than student 4.

Note 1:
As the prompt in part (a) only calls for an identification of the relevant students, one point each was given in part (a) for correctly identifying student 1 and for correctly identifying student 4. The explanation regarding net force was not taken into consideration. If, however, the response identified student 1 or 4 and an incorrect second student, no credit was awarded. It was seen both as being multiple errors (an omission and an incorrect selection) and as demonstrating no understanding of the concept being illustrated. Students 1 and 3 comprise an exception to this rule.

Note 2:
In part (a), if student names only student 1, score is 2 points; if student names student 1 and 4, score is 2 points; if student names 1 and 3, score is 1 point.

b. The forces applied by students 2 and 3 have no effect on the motion of the box. The box will continue to move toward the right, even if students 2 and 3 stop pushing the box.

Note:
In part (b), the response “nothing will happen” is taken to mean that the net force does not change, that the box keeps moving in the same direction, keeps doing what it’s doing, etc.

c. If student 1 stops pushing the box, then the net force will be applied by student 4. Thus, the box will start moving toward left.

Part (a) is worth 2 points, part (b) is worth 1 point, and part (c) is worth 1 point.

Sample 4-Point Response with Annotations for Constructed-Response Item 21

21.

a. (student 1) is pushing harder than 4. (Unequal forces)

b. nothing would make a differance. The box is connected to the surface they are standing on rather than the floor.

c. student 4 would push it to the left.

Summary annotation statement:

The response answers part (a) correctly by identifying the students involved in the resulting net force. For part (b), the phrasing 'nothing would make a difference' is clarified by the next sentence 'the box is connected to the surface they are standing on rather than the floor.' The support of the second sentence makes it clear that 'nothing would make a difference' means 'nothing will change.' Part (c) is also answered correctly. The response is complete and contains no errors; the response earns a score of 4.

Sample 3-Point Response with Annotations for Constructed-Response Item 21

21.

a) Student 1 because his force is stronger than student 4

b) Student 1+4 would run into each other, because the box would crush

c) Student 2 would fall through the box and student 4 would start pushing the box through the left

Summary annotation statement:

Part (a) indicates the correct students and provides some depth about their interaction; the identification is enough to earn full credit for part (a). Part (b)'s response states that 'student 1 and 4 would run into each other, because the box would crush'; this is incorrect as the box is stated as being rigid in the prompt. Part (c) carries forward the error that the box might fall apart but does go on to state that student 4 'would start pushing the box through the left,' so credit is given. Parts (a) and (c) are answered correctly; this presents a general understanding of the material and receives a score of 3.

Sample 2-Point Response with Annotations for Constructed-Response Item 21

21.

A. Student(s) 1 and 4.

B. If they stop pushing the box the box will break.

C. if he stoped pushing student 4 would push straight.

Summary annotation statement:

The response correctly identifies both students involved in determining the net force of movement on the box, students 1 and 4, and receives full credit for part (a). Part (b) is incorrect, and no credit is earned. 'Push straight' does not indicate anything new, since in the initial diagram, the student is already pushing straight. The direction of movement needs to be indicated, so part (c) earns no credit. The response provides a correct answer to the prompt for part (a), showing a limited understanding, and receives a score of 2.

Sample 1-Point Response with Annotations for Constructed-Response Item 21

21.

(a. Student 2 and student 4)

(b. The box would stay still cause Student 1 and 4 would be pushing off on each other.)

(c. The box would probably be going more to the left other then the right.)

Summary annotation statement:

The response omits student 1 from part (a), receiving no credit. Part (b) is incorrect, stating that 'the box would stay still cause student 1 and 4 would be pushing off on each other.' Part (c) does provide a correct element, stating that the box would 'be going more to the left other then the right'; this is taken to mean that the box would stop moving right and proceed to the left. The response shows a minimal understanding, providing one correct element to the prompt, and receives a score of 1.

Sample 0-Point Response with Annotations for Constructed-Response Item 21

21.

I think student 2 is moving the box. If student 4 stops pushing on the box I don't think it would move.

Summary annotation statement:

The response incorrectly states that 'student 2 is moving the box.' It then proceeds to discuss, incorrectly, what would happen if student 4 stopped pushing on the box, which is not asked in the prompt for parts (a), (b), or (c). No correct relevant material is present which results in a score of 0.

Constructed-Response Item 22

22 Corn can be genetically modified to contain a chemical that is poisonous to many insects. All parts of the genetically modified corn plant can make this chemical throughout the life of the corn. When an insect eats any part of the corn plant, the insect eats the chemical and dies. This chemical is harmless to humans and other mammals.

a. Describe **two** benefits to farmers who use the genetically modified corn.

b. Describe **two** negative environmental impacts of using the genetically modified corn.

Scoring Guide for Constructed-Response Item 22

Score	Description
4	The response demonstrates a thorough understanding of genetic modifications to plants and their impact. The response describes two benefits to farmers and two possible negative environmental impacts. The response has no errors or omissions.
3	The response demonstrates a general understanding of genetic modifications to plants and their impact. The response has one error or omission.
2	The response demonstrates a limited understanding of genetic modifications to plants and their impact. The response has errors or omissions.
1	The response demonstrates a minimal understanding of genetic modifications to plants and their impact. The response has one correct piece of information.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes for Constructed-Response Item 22

a. Benefits to farmers:

- Farmers will not need to use pesticide chemicals to kill insects that eat corn.
- Farmers will lose less corn to insect pests.
- Farmers could use less land to produce the same amount of corn.
- Farmer's cost would decrease.
- Less oil used.
- Higher yield, more corn is produced, or less corn is lost; any of these 3 responses is acceptable but not more than one for a score of 1 point.
- "More bugs will die" is acceptable, but "bug will die" is not acceptable.
- Genetic modification does not cause environmental damage, whereas using pesticides does.
- The corn is not damaged (because any part will kill the insects).
- Corn is safe for feeding to livestock e.g., cattle, goats.

b. Possible negative impacts on environment:
(Responses need to address environmental impacts.)

- Non-mammal animals eating dead corn plants may die.
- Insects eating pollen may die.
- Animals that usually eat insects that eat corn will have less food.
- Insects that eat affected insects may die.
- New strains of insects that are harmful could evolve.
- Unknown allergies could develop.

- Potential for species on which the insects predate to overpopulate. (There are some omnivorous species of insects.)
- Through the ultimate decomposition of corn refuse. Since all parts contain the chemical, it could be released into the soil, and could potentially be harmful.
- The chemical could be harmful to domesticated fowls (chickens in particular) that could consume it either as feed or accidentally. (The prompt specifies mammals.)

Note:
No credit for genetic modification in terms of "chemicals sprayed on corn."

Part (a) is worth 2 points and part (b) is worth 2 points.

Sample 4-Point Response with Annotations for Constructed-Response Item 22

22.

a. This genetically modified corn can provide great benefits to farmers who use it, such as reducing the amount of crops that are lost to insects. This would provide a farmer with more corn, and therefore more income. It will also keep the insect population under control so that there are not enough to greatly damage other crops the farmer grows. These are two very good reasons to use the genetically modified corn, but there are also negative environmental impacts (b), such as causing the insect population to plummet and effect the food chain of the surrounding area, possibly making certain species abandon the area or simply die of starvation. It could also effect birds and other wildlife. The description says it's harmless to humans and other mammals, but considering that not all wildlife in an area will be mammalian, this could have devestating effects if other animals eat it. There are many reasons for and against genetically modified corn, but in the end the farmers must decide.

Summary annotation statement:

For part (a) the response provides two descriptions. The first is the reduction of crop loss to insects leading to increased profits, the other is the insect population reduction can help increase the yield of the farmer's 'other' crops. Part (b) offers two valid descriptions, the first being an effect on the food web leading species to 'abandon the area or simply die of starvation.' The other is potential to poison non-mammalian animals such as birds. The response provides valid descriptions and has no omissions or errors which results in a score of 4.

Sample 3-Point Response with Annotations for Constructed-Response Item 22

22.

(A) Two benifits of the corn are one In no way is the corn harmful to other mamals so it can be fed to livestock or small animals. It also helps keep crop damage down from Insects which can be helpful to animals who live in locust ravaged areas.

(B) Certain insects are important food sources to small animals. If large ammounts eat the corn it might affect them and they could starve. Also if small animals die off large ones will too. Then the herbivores will overpopulate.

Summary annotation statement:

The response describes two valid benefits to the farmer; the corn is not harmful to livestock, so it can be used as feed, and crop damage is reduced in overpopulated insect areas. For part (b), the response presents a description of the modified corn's effect on the food web. The language is not precise, but the meaning is clear when looking at the whole paragraph. For having a complete part (a) and one valid description in part (b), this response is scored a 3.

Sample 2-Point Response with Annotations for Constructed-Response Item 22

22.

a) Less insects. 2) more corn.

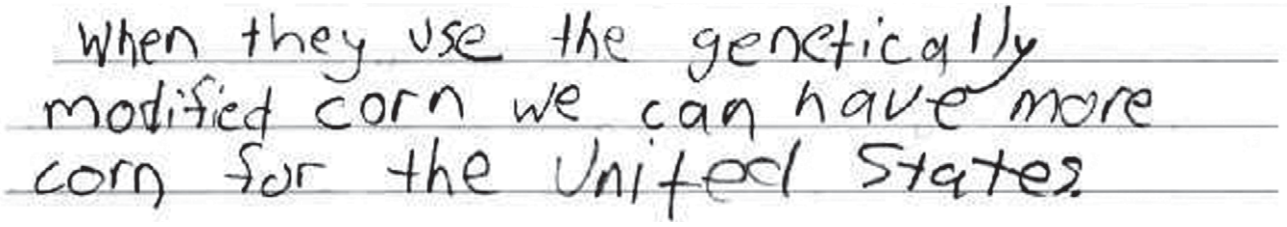
b) Pollution. Poison.

Summary annotation statement:

Two brief but correct benefits are listed for part (a): 'less insects' and 'more corn.' Part (b) would require further explanation for credit. The response shows a limited understanding and receives a score of 2.

Sample 1-Point Response with Annotations for Constructed-Response Item 22

22.



Summary annotation statement:

The response provides a statement that 'we can have more corn for the United States'; this is taken as a description of the benefit of increased crops. For this correct element in part (a), the response receives a score of 1.

Sample 0-Point Response with Annotations for Constructed-Response Item 22

22.

a. Corn is genetically modified and attracted by insects.

Summary annotation statement:

The response contains no correct material related to the prompt and receives a score of 0.